

ARL 01-37

RECEIVED
CENTRAL FAX CENTER

OCT 09 2007

Amendments to the Claims:

This listing of Claims will replace all prior versions and listings of Claims in the Application.

Listing of Claims:

Claims 1-12 (cancelled)

Claim 13 (currently amended): An electrolyte solution for a metal-oxygen battery where oxygen is reduced at a cathode surface to produce O^{2-} or O_2^{2-} ions, the electrolyte comprising:

a lithium salt selected from the group consisting of $LiPF_6$, $LiBF_4$, $LiClO_4$, $LiC(SO_2CF_3)_3$, $LiN(SO_2CF_3)_2$, $LiO_3SCF_2CF_3$, LiO_3SCF_3 , LiO_2CCF_3 , $LiP(C_6H_5)_4$, $LiCF_3SO_3$; and

~~a non-aqueous solvent comprises a material selected from the group consisting of dimethyl carbonate (DMC), dipropyl carbonate (DPC), diethyl carbonate (DEC), ethyl methyl carbonate (EMC), tetrahydrofuran (THF), and 1,2-dimethoxyethane (DME); wherein the oxygen solubility of the solvent is at least 0.1150 cc O_2 /cc at STP;~~

a non-aqueous solvent selected from the group of solvents having an oxygen solubility of greater than 0.1632 cc O_2 /cc solvent at STP consisting of dimethyl carbonate (DMC), dipropyl carbonate (DPC), diethyl carbonate (DEC), ethyl methyl carbonate (EMC), tetrahydrofuran (THF), and 1,2-dimethoxyethane (DME), in combination with one or more solvents having an oxygen solubility of less than 0.1150 cc O_2 /cc solvent at STP selected from a group consisting of propylene carbonate (PC), ethylene carbonate (EC), and γ -butyrolactone (γ -BL);

ARL 01-37

wherein the oxygen solubility of the solvent combination is at least 0.1150 cc
O₂/cc at STP; and

wherein oxygen is reduced at a cathode surface of the metal-oxygen battery to
produce O⁻² or O₂⁻² ions and an increase in the amount of dissolved oxygen in the
electrolyte increases the specific capacity of the cathode.

Claim 14 (currently amended): A metal-oxygen battery ~~where oxygen is reduced at a~~
~~cathode to produce O⁻² or O₂⁻² ions~~, the battery comprising:

a metal-containing anode;

a cathode for reducing the oxygen; and

an electrolyte solution of a lithium salt selected from the group consisting of
LiPF₆, LiBF₄, LiClO₄, LiC(SO₂CF₃)₃, LiN(SO₂CF₃)₂, LiO₃SCF₂CF₃, LiO₃SC₆F₅,
LiO₂CCF₃, LiP(C₆H₅)₄, LiCF₃SO₃; and

a non-aqueous solvent for the electrolyte selected from the group of solvents
having an oxygen solubility of greater than 0.1632 cc O₂/cc solvent at STP consisting of
dimethyl carbonate (DMC), dipropyl carbonate (DPC), diethyl carbonate (DEC), ethyl
methyl carbonate (EMC), tetrahydrofuran (THF), and 1,2-dimethoxyethane (DME), in
combination with one or more solvents having an oxygen solubility of less than 0.1150 cc
O₂/cc solvent at STP selected from a group consisting of propylene carbonate (PC),
ethylene carbonate (EC), and γ -butyrolactone (γ -BL);

wherein the oxygen solubility of the solvent combination is at least 0.1150 cc
O₂/cc at ~~STP~~ STP; and

ARL 01-37

wherein oxygen is reduced at a cathode surface of the metal-oxygen battery to produce O^{2-} or O_2^{2-} ions and an increase in the amount of dissolved oxygen in the electrolyte increases the specific capacity of the cathode.

Claim 15 (previously presented): The metal-oxygen battery of claim 14, wherein the cathode comprises carbon.

Claim 16 (currently amended): A lithium-oxygen battery ~~where oxygen is reduced at a cathode to produce O^{2-} or O_2^{2-} ions which react with lithium to produce Li_2O_2 , that deposit on the cathode,~~ the battery comprising:

a lithium metal-containing anode;

a cathode for reducing oxygen;

an electrolyte solution of a lithium salt selected from the group consisting of $LiPF_6$, $LiBF_4$, $LiClO_4$, $LiC(SO_2CF_3)_3$, $LiN(SO_2CF_3)_2$, $LiO_3SCF_2CF_3$, $LiO_3SC_6F_5$, LiO_2CCF_3 , $LiP(C_6H_5)_4$, $LiCF_3SO_3$; and

~~a non-aqueous solvent for the electrolyte selected from the group consisting of dimethyl carbonate (DMC), dipropyl carbonate (DPC), diethyl carbonate (DEC), ethyl methyl carbonate (EMC), tetrahydrofuran (THF), and 1,2-dimethoxyethane (DME), wherein the oxygen solubility of the solvent is at least 0.1150 cc O_2 /cc at STP.~~

ARL 01-37

a non-aqueous solvent selected from the group of solvents having an oxygen solubility of greater than 0.1632 cc O₂/cc solvent at STP consisting of dimethyl carbonate (DMC), dipropyl carbonate (DPC), diethyl carbonate (DEC), ethyl methyl carbonate (EMC), tetrahydrofuran (THF), and 1,2-dimethoxyethane (DME), in combination with one or more solvents having an oxygen solubility of less than 0.1150 cc O₂/cc solvent at STP selected from a group consisting of propylene carbonate (PC), ethylene carbonate (EC), and γ -butyrolactone (γ -BL);

wherein the oxygen solubility of the solvent combination is at least 0.1150 cc O₂/cc at STP; and

where oxygen is reduced at a cathode to produce O⁻² or O₂⁻² ions which react with lithium to produce Li₂O₂, that deposits on the cathode.

Claim 17 (currently amended): The lithium-metal battery of claim 17 ~~16~~ wherein the cathode comprises carbon.

Claim 18 (withdrawn): An electrolyte solution for a metal-oxygen battery where oxygen is reduced at a cathode surface to produce O⁻² or O₂⁻² ions, the electrolyte comprising:

a lithium salt selected from the group consisting of LiPF₆, LiBF₄, LiClO₄, LiC(SO₂CF₃)₃, LiN(SO₂CF₃)₂, LiO₃SCF₂CF₃, LiO₃SC₆F₅, LiO₂CCF₃, LiP(C₆H₅)₄, LiCF₃SO₃; and

a non-aqueous solvent further comprising a combination of propylene carbonate and at least one of a material selected from the group consisting of dimethyl carbonate

ARL 01-37

(DMC), dipropyl carbonate (DPC), diethyl carbonate (DEC), ethyl methyl carbonate (EMC), tetrahydrofuran (THF), and 1,2-dimethoxyethane (DME), wherein the oxygen solubility of the solvent is at least 0.1150 cc O₂/cc at STP.

Claim 19 (withdrawn): A metal-oxygen battery where oxygen is reduced at a cathode to produce O⁻² or O₂⁻² ions, the battery comprising:

a metal-containing anode;

a cathode for reducing the oxygen;

an electrolyte solution of a lithium salt selected from the group consisting of LiPF₆, LiBF₄, LiClO₄, LiC(SO₂CF₃)₃, LiN(SO₂CF₃)₂, LiO₃SCF₂CF₃, LiO₃SC₆F₅, LiO₂CCF₃, LiP(C₆H₅)₄, LiCF₃SO₃; and

a non-aqueous solvent further comprising a combination of propylene carbonate and at least one of a material selected from the group consisting of dimethyl carbonate (DMC), dipropyl carbonate (DPC), diethyl carbonate (DEC), ethyl methyl carbonate (EMC), tetrahydrofuran (THF), and 1,2-dimethoxyethane (DME), wherein the oxygen solubility of the solvent is at least 0.1150 cc O₂/cc at STP.

Claim 20 (withdrawn): The A metal-oxygen battery of claim 19 wherein the metal-containing anode is a lithium metal-containing anode.

Claim 21 (withdrawn): An electrolyte solution for a metal-oxygen battery where oxygen is reduced at a cathode surface to produce O⁻² or O₂⁻² ions, the electrolyte comprising:

ARL 01-37

a lithium salt selected from the group consisting of LiPF_6 , LiBF_4 , LiClO_4 , $\text{LiC}(\text{SO}_2\text{CF}_3)_3$, $\text{LiN}(\text{SO}_2\text{CF}_3)_2$, $\text{LiO}_3\text{SCF}_2\text{CF}_3$, $\text{LiO}_3\text{SC}_6\text{F}_5$, LiO_2CCF_3 , $\text{LiP}(\text{C}_6\text{H}_5)_4$, LiCF_3SO_3 ; and

a non-aqueous solvent further comprising a combination of γ -butyrolactone (γ -BL) and at least one of a material selected from the group consisting of dimethyl carbonate (DMC), dipropyl carbonate (DPC), diethyl carbonate (DEC), ethyl methyl carbonate (EMC), tetrahydrofuran (THF), and 1,2-dimethoxyethane (DME), wherein the oxygen solubility of the solvent is at least 0.1150 cc O_2 /cc at STP.

Claim 22 (withdrawn): An electrolyte solution for a metal-oxygen battery where oxygen is reduced at a cathode surface to produce O^{2-} or O_2^{2-} ions, the electrolyte comprising:

a lithium salt selected from the group consisting of LiPF_6 , LiBF_4 , LiClO_4 , $\text{LiC}(\text{SO}_2\text{CF}_3)_3$, $\text{LiN}(\text{SO}_2\text{CF}_3)_2$, $\text{LiO}_3\text{SCF}_2\text{CF}_3$, $\text{LiO}_3\text{SC}_6\text{F}_5$, LiO_2CCF_3 , $\text{LiP}(\text{C}_6\text{H}_5)_4$, LiCF_3SO_3 ; and

a non-aqueous solvent further comprising a combination of dimethyl sulfoxide (DMSO) and at least one of a material selected from the group consisting of dimethyl carbonate (DMC), dipropyl carbonate (DPC), diethyl carbonate (DEC), ethyl methyl carbonate (EMC), tetrahydrofuran (THF), and 1,2-dimethoxyethane (DME), wherein the oxygen solubility of the solvent is at least 0.1150 cc O_2 /cc at STP.

Claim 23 (withdrawn): An electrolyte solution for a metal-oxygen battery where oxygen is reduced at a cathode surface to produce O^{2-} or O_2^{2-} ions, the electrolyte comprising:

ARL 01-37

a lithium salt selected from the group consisting of LiPF_6 , LiBF_4 , LiClO_4 , $\text{LiC}(\text{SO}_2\text{CF}_3)_3$, $\text{LiN}(\text{SO}_2\text{CF}_3)_2$, $\text{LiO}_3\text{SCF}_2\text{CF}_3$, $\text{LiO}_3\text{SC}_6\text{F}_5$, LiO_2CCF_3 , $\text{LiP}(\text{C}_6\text{H}_5)_4$, LiCF_3SO_3 ; and

a non-aqueous solvent further comprising a combination of N-methyl pyrrolidinone (NMP) and at least one of a material selected from the group consisting of dimethyl carbonate (DMC), dipropyl carbonate (DPC), diethyl carbonate (DEC), ethyl methyl carbonate (EMC), tetrahydrofuran (THF), and 1,2-dimethoxyethane (DME), wherein the oxygen solubility of the solvent is at least 0.1150 cc O_2 /cc at STP.

Claim 24 (withdrawn): An electrolyte solution for a metal-oxygen battery where oxygen is reduced at a cathode surface to produce O^{2-} or O_2^{2-} ions, the electrolyte comprising:

a lithium salt selected from the group consisting of LiPF_6 , LiBF_4 , LiClO_4 , $\text{LiC}(\text{SO}_2\text{CF}_3)_3$, $\text{LiN}(\text{SO}_2\text{CF}_3)_2$, $\text{LiO}_3\text{SCF}_2\text{CF}_3$, $\text{LiO}_3\text{SC}_6\text{F}_5$, LiO_2CCF_3 , $\text{LiP}(\text{C}_6\text{H}_5)_4$, LiCF_3SO_3 ; and

a non-aqueous solvent further comprising a combination of tetraethylene glycol dimethyl ether and at least one of a material selected from the group consisting of dimethyl carbonate (DMC), dipropyl carbonate (DPC), diethyl carbonate (DEC), ethyl methyl carbonate (EMC), tetrahydrofuran (THF), and 1,2-dimethoxyethane (DME), wherein the oxygen solubility of the solvent is at least 0.1150 cc O_2 /cc at STP.

Claim 25 (withdrawn): An electrolyte solution for a metal-oxygen battery where oxygen is reduced at a cathode surface to produce O^{2-} or O_2^{2-} ions, the electrolyte comprising:

ARL 01-37

a lithium salt selected from the group consisting of LiPF_6 , LiBF_4 , LiClO_4 , $\text{LiC}(\text{SO}_2\text{CF}_3)_3$, $\text{LiN}(\text{SO}_2\text{CF}_3)_2$, $\text{LiO}_3\text{SCF}_2\text{CF}_3$, $\text{LiO}_3\text{SC}_6\text{F}_5$, LiO_2CCF_3 , $\text{LiP}(\text{C}_6\text{H}_5)_4$, LiCF_3SO_3 ; and

a non-aqueous solvent further comprising a combination of trichylene glycol dimethyl ether and at least one of a material selected from the group consisting of dimethyl carbonate (DMC), dipropyl carbonate (DPC), diethyl carbonate (DEC), ethyl methyl carbonate (EMC), tetrahydrofuran (THF), and 1,2-dimethoxyethane (DME), wherein the oxygen solubility of the solvent is at least 0.1150 cc O_2 /cc at STP.